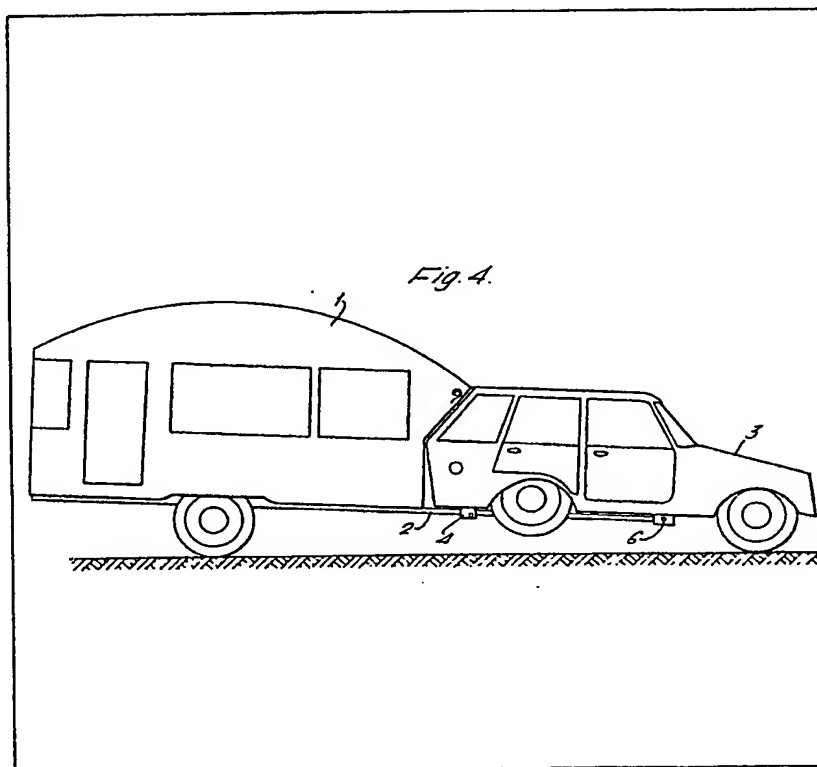


(12) UK Patent Application (19) GB (11) 2 006 130 A

- (21) Application No. 7842480  
(22) Date of filing 30 Oct 1978  
(23) Claims filed 30 Oct 1978  
(30) Priority data  
(31) 32065/77  
(32) 29 Jul 1977  
(33) United Kingdom (GB)  
(43) Application published  
2 May 1979  
(51) INT CL<sup>2</sup>  
B62D 63/02  
B60D 1/00  
(52) Domestic classification  
B7B 287 28Y 296 C  
B7T D3C2  
(56) Documents cited  
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GB 567975  
GB 401267  
(58) Field of search  
B7B  
B7H  
B7T  
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(54) Composite vehicles

(57) A steerable self-propelled road vehicle 3 is adapted to receive at its rear end a second wheeled vehicle 1 in rigid detachable connection, there being means provided for raising the rear wheel axle or axles of the vehicle 3 away from the ground when the two vehicles are joined. The preferred arrangement incorporates means 2, 4, 6 for automatically aligning the two vehicles, for example a car 3 with a caravan 1, as they are joined so that no external aligning means is required even on an uneven terrain. The car 3 may be either front or rear wheel drive. In the latter case the drive for the composite vehicle is provided by a separate engine in the caravan 1 which is coupled to the manual control of the car 3.

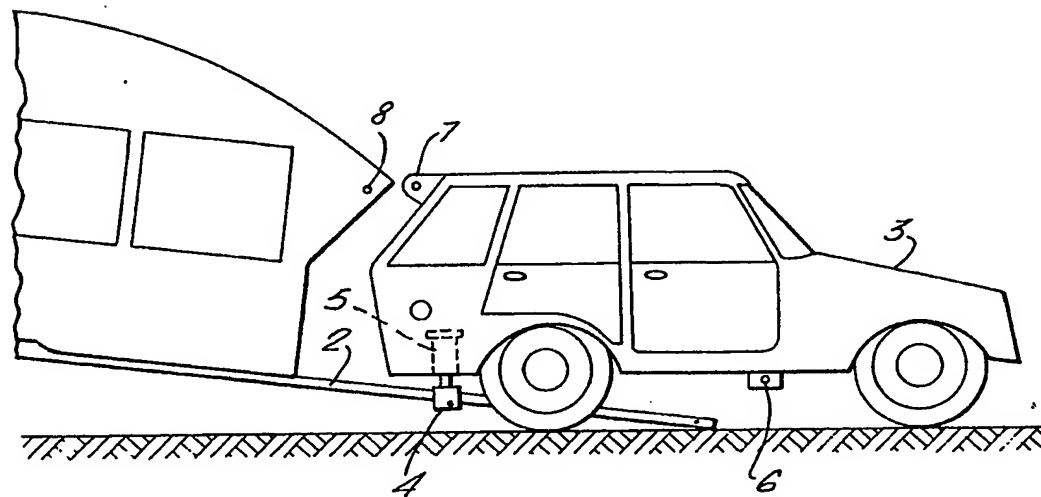
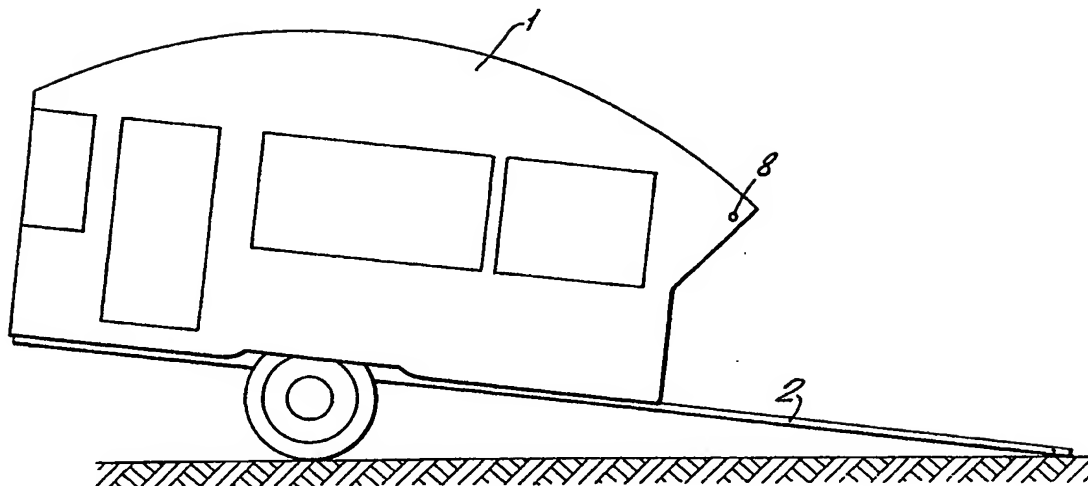


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Fig. 1.



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Fig. 3.

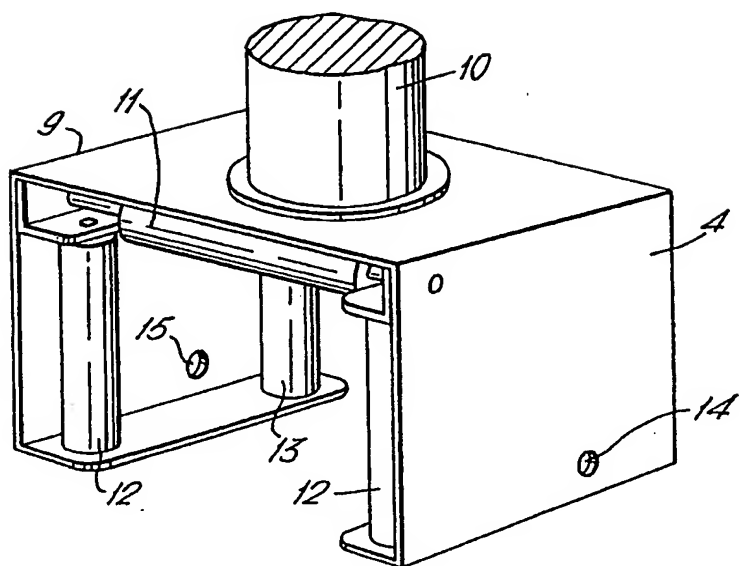
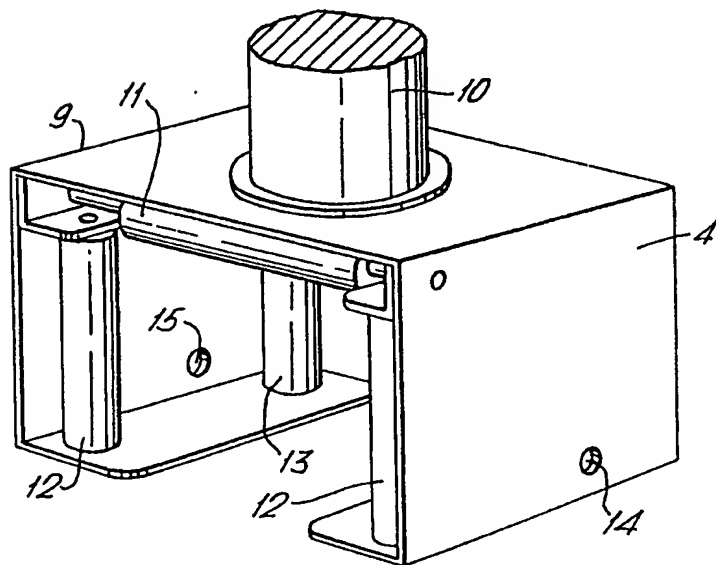


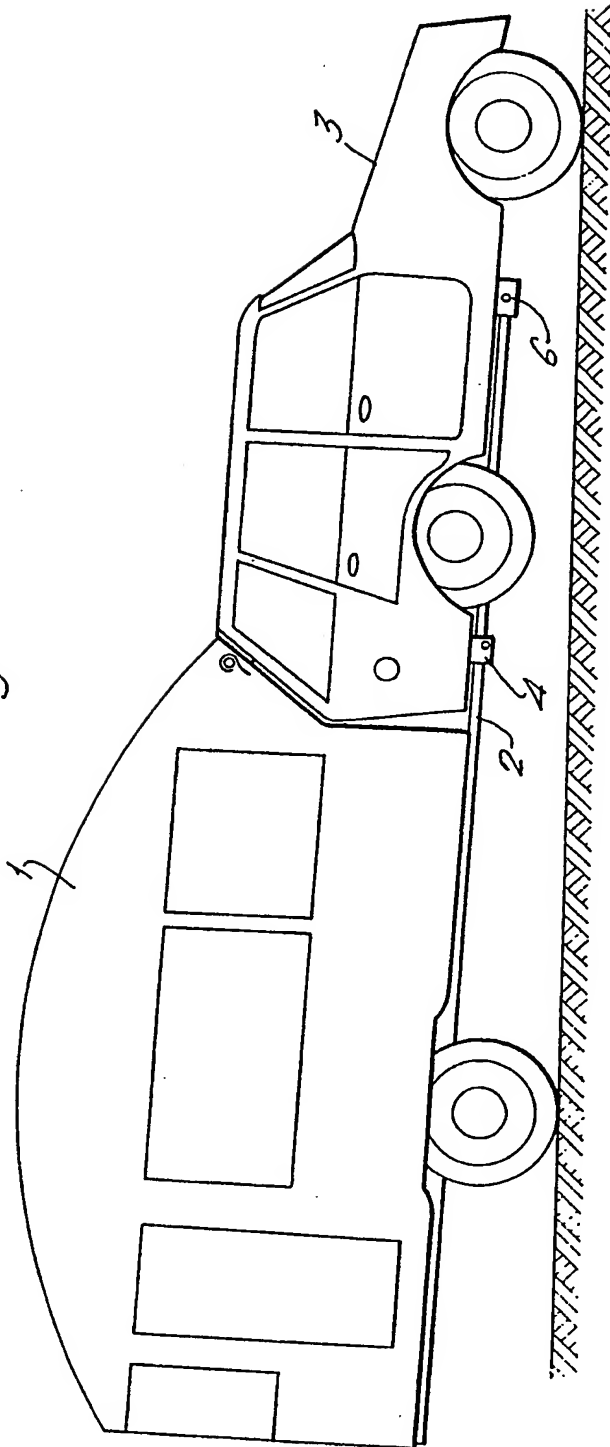
Fig. 5.



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Fig. 4.



## SPECIFICATION

## Improvements relating to motor cars

5 This invention relates to body extensions to motor cars, pick up trucks, vans and similar steerable self-propelled vehicles, in particular to body extensions to passenger-carrying motor cars mainly of the saloon type whereby living accommodation or additional goods carrying space is provided thereto.

10 Towable caravans and trailers, as is well known, though admirable in many respects for the purpose of providing mobile living accommodation (or goods carrying space in the case of trailers) have limitations both in respect of the effect on the handling performance of the vehicle used to provide the two and the allowable weight thereof which should not be exceeded for a given towing vehicle. These drawbacks are overcome by building the living accommodation or additional goods carrying space into the basic steerable, self-propelled vehicle, an example of such a vehicle being the Dormobile. However, the user then has to accept the permanent disadvantage that whenever the vehicle is used, the part providing living accommodation, or extra space, goes with the vehicle whatever the journey since it is an integral part thereof. Running and maintenance cost are therefore increased.

15 The present invention provides a third solution to the requirements for personal living accommodation whilst touring or for additional vehicle space. It is proposed that a single-axle wheeled cart as defined hereinafter be provided which is attached to a standard steerable motorized road vehicle in a rigid manner to form a composite vehicle in such a way as to increase the wheel base of the composite vehicle but which is detachable therefrom to leave the original vehicle intact and fully functional. The expression "single axle wheeled cart" is intended to include within its scope single-axled or split-axle two wheeled trailers and caravans whether or not the wheels are independently sprung, single wheeled trailers or carriages and four or more wheeled caravans or trailers where the wheels are road wheels set close together.

20 Accordingly the invention provides a composite road vehicle comprising first and second parts, the first part comprising a steerable self-propelled road vehicle adapted to receive at the rear end thereof the second part in rigid detachable connection, the second part comprising a single axle wheeled cart as hereinbefore defined, and means for raising the rear wheel axles of the vehicle of the said first part away from the ground when the two parts are joined. Preferably the said cart is provided with at least one girder rigidly fastened thereto and extending in front of the cart to a free end in a plane parallel to the floor plane of the cart, said girder being of such a length that when the cart abuts the rear of the vehicle of the first part the girder extends substantially forward of the rear wheels of the said vehicle. Under the rear of the latter there is correspondingly provided slidable girder aligning means which comprises engaging means and means for pivotal connection of the aligning means with the girder, a

slidable fulcrum thereby existing having a horizontal pivotal axis normal to the fore and aft axis of the vehicle of the first part, means for raising and lowering the engaging means, and means for raising the free end of the girder to the floor of the vehicle of the first part and clamping it rigidly thereto. As the free end of the girder is lifted, the rear end of the vehicle of the first part and hence the vehicle rear wheels are similarly raised and the cart wheels now act as the rear wheels of the composite vehicle. To prevent any contact, during use of the composite vehicle over a rough terrain, of the rear wheels of the vehicle of the first part with the ground the latter may be removed. Alternatively, lifting pads may be provided on the girder which engage the undersides of the vehicle rear wheel mountings when the said engaging means is lifted, thereby compressing the rear wheel suspension. Of course, suitable connections and linkages are provided between the cart and the vehicle of the first part to comply with legal requirements in respect of rear vehicle lighting, etc. and brakes. Moreover, in circumstances where the combination is between a cart as herein disclosed and a rear wheel driven vehicle or in circumstances where extra propulsion is required an auxiliary power unit providing drive to the wheels of the cart is incorporated in the cart and suitable control linkages to operate this auxiliary power unit are incorporated. In the preferred embodiment of the invention the body of the vehicle of the first part is rigidly clamped to the body of the cart at points near the roof of the vehicle.

Hereinafter a vehicle according to the invention is further described by way of example and with reference to the accompanying drawings wherein:

Figure 1 illustrates an embodiment of the cart of the invention before its attachment to a vehicle adapted to the invention;

Figure 2 illustrates the girder clamping points on the vehicle of the first part adapted to the invention;

Figure 3 illustrates diagrammatically the aligning means in isolation from the vehicle of Figure 2;

Figure 4 illustrates the composite vehicle ready for use; and

Figure 5 illustrates a modified form of the aligning means of Figure 3.

In Figure 1 there is shown a caravan 1 to which there is rigidly attached a vehicle supporting girder 2 in place of the usual "A" frame. This girder is of sufficient length to extend to somewhere near the front wheels of the associated steerable vehicle when the latter is mounted on the girder. It has a cross section to resist flexing in the vertical plane when bearing the weight of the associated steerable vehicle, e.g. a box cross section. As seen in Figure 2 and 4 the steerable vehicle in this embodiment of the invention comprises a small front wheel drive saloon car 3. If a rear wheel drive car is substituted a winch (not shown) will be required so as to draw the car along the girder when mating the two parts of the composite vehicle. In Figure 2 the car is shown partially backed onto the girder 2.

At the rear end of the car beneath the floor is a girder engaging bracket 4 which is described in more detail later in relation to Figure 3. Bracket 4 is

mounted on the extensible end of a hydraulic forward and reverse acting jack 5 rigidly mounted on the underside of the car body. The jack 5 receives a supply of pressure fluid (e.g. oil) via a driver operable control from a pump (not shown) which can be

5 operated by the car engine or by a battery driven electric motor.

Between the front and rear wheels of the car is a fixed girder receiving bracket 6. This is shaped to snugly receive the end of the girder 2 which may be rigidly fastened therein by passing a pin through specially prepared apertures provided in the bracket and the girder. Spaced apart lugs 7 at the top rear of the car match with corresponding lugs 8 on the

15 caravan when the two are properly assembled. These may all be fastened together by means of quick release toggles (not shown) for example, over centre levers of the Highfield type as used in yacht rigging, or by means of pins passed through holes 7 and 8.

Referring now to Figure 3, girder engaging bracket 4 comprises an inverted U-shaped frame member 9 which may be pivotally attached to the extendable shaft 10 of the jack 5 (not shown in Figure 3). Lining the inside of this frame member are horizontal rollers 11 and vertical rollers 12 and 13, said vertical rollers being in matched pairs. The rollers 12 are set further apart than the rollers 13 (only one shown), the latter just admitting the girder 2

30 with minimum clearance. Coaxial apertures 14, 15 are positioned in the frame at a greater distance beneath the periphery of rollers 11 than the depth dimension of the girder 2 so as to permit limited relative pivoting of the girder within the bracket 4 about a pin (not shown) inserted in the apertures 14, 15.

When the driver wishes to couple the car and the caravan he proceeds as follows. The caravan 1 is positioned behind the car 3 with the girder 2 tilted so that its free end rests on the ground and with the girder immediately beneath the bracket 4. The jack 5 is then actuated so that the bracket 4 is lowered and the car is backed up to the girder until the latter is engaged by the bracket 4. Further rearward movement of the car aligns the caravan with the car and lifts the rear end of the latter as the bracket slides up the girder on the rearmost roller 11. The rearward movement is limited by means of a stop (not shown) on the girder and in this position the free end of the girder is aligned with and is immediately beneath the bracket 6. A pivot pin is inserted through the apertures 14, 15 beneath the girder 2 and secured therein. By means not shown, which may be a simple winch operated through the floor of the car, the free end of the girder 2 is brought into engagement with the bracket 6. A fastening pin is inserted through the aperture in the bracket 6 and the girder, which should now be precisely aligned, and is secured therein and the winch is uncoupled and removed. The jack 5 is retracted, the rear wheels of the car having been removed if necessary, and the two sets of lugs 7, 8 are coupled by a pair of over centre levers or by pins. Lastly the caravan lighting and hydraulic brake systems are coupled to the car.

Assuming that the rear wheels of the car not to have been removed but compressed on their suspensions this leaves the assembly as a composite extended vehicle as shown diagrammatically in

70 Figure 4.

In order to compress the car rear wheels it is convenient to provide one or more bars welded to the girder at right angles which, when the car is against the stop, is in a position immediately beneath and parallel to the car axle, if the car has a rear axle, or which has parts which are in position beneath the wheel supports in an independently sprung vehicle. As the jack retracts pads at the end of the bar, or on the said parts, force the wheels up against the car springs.

80 In order to help with alignment in the rolling plane during the linking process, and in order to give adequate chassis strength and ground clearance to the composite vehicle, an additional girder may be welded at or near each front corner of the caravan so that it extends in a generally forward direction. Corresponding inclined planes are provided on the underside of the car which planes contact the added girders if there is a displacement in the rolling plane. Additionally quick release fastening means may be provided for fastening the ends of these girders to the underside of the car. A controllable self-levelling system, as commonly used on some modern cars, may be fitted to the caravan suspension to provide a facility to increase ground clearance by extending the suspension before proceeding on rough ground.

90 Additional strengthening for the lugs 8 may be provided by means of an inverted "U" shaped tube welded at an angle to the subframe of the caravan. Where additional driving power is to be provided by the caravan this may be any self contained power unit.

100 In a modified arrangement the bracket 4 is widened as shown in Figure 5 and the pairs of vertical rollers 12, 13 are spaced further apart so as to snugly receive a thickened portion (not shown) of the girder 2 arranged only in the vicinity of the stop. Inward extending flanges are provided at the bottom of the bracket which define a gap therebetween just wide enough to receive the girder along its normal, thinner section. preferably co-operating means is provided on the thickened portion of the girder and the said flanges of the bracket whereby the fastening pin is relieved of any vertical stresses which might otherwise occur when the composite vehicle is in use. Because of the presence in the bracket of the thickened section of the girder, the girder is retained within the bracket by the said flanges should the fastening pin shear, or be dislodged.

#### CLAIMS

125 1. A composite road vehicle comprising first and second parts, the first part being a steerable self-propelled road vehicle adapted to receive at the rear end thereof the second part in rigid detachable connection, the second part being a single axle

130 wheeled cart as hereinbefore defined, and means

for raising the rear wheel axles of the vehicle of the first part away from the ground when the two parts are joined.

2. A composite road vehicle according to Claim 1 wherein said cart is provided with at least one girder rigidly fastened thereto and extending in front of the cart to a free end in a plane parallel to the floor plane of the cart, said girder being of such a length that when the two parts of the composite vehicle are joined the girder extends substantially forward of the rear wheels of the vehicle of the first part, and wherein the latter is provided with slidable girder aligning means.

3. A composite road vehicle according to Claim 2 wherein the said girder is of hollow box section.

4. A composite road vehicle according to Claim 2 or Claim 3 wherein an additional girder is provided at, or near, each front corner of the cart, which girder extends in a generally forward direction and parallel to the floor plane of the cart so as to correspond with a member having an inclined plane which is provided on the underside of the vehicle of the first part, said members limiting any displacement of the cart in the rolling plane relative to the said vehicle by engaging with the respective girders.

5. A composite road vehicle according to any of Claims 2 to 4 wherein said aligning means comprises girder engaging means and means for pivotal connection of the aligning means with the said at least one girder, said pivotal means providing a slidable fulcrum having a horizontal pivotal axis normal to the fore and aft axis of the vehicle of the first part.

6. A composite vehicle according to Claim 5 wherein said aligning means comprises an inverted U-shaped frame member attached to the extendable shaft of an extendable end retractable jack mounted on the underside of the vehicle of the first part, the depending legs of the frame member embracing the said girder and being apertured along a horizontal axis in a direction normal to the fore and aft axis of the said vehicle so as to captively receive a pin, said apertures being positioned such that the pin when inserted in the frame member will engage the underside of the girder received in the frame member.

7. A composite vehicle according to Claim 6 wherein said frame member is provided internally with vertical and horizontal rollers which rollingly engage the sides of said girder.

8. A composite vehicle according to Claim 7 wherein the said vertical rollers comprises two matched pairs one pair leading the other relative to engaging the girder, the leading pair being set apart to provide a clearance between them and the girder when the latter is coupled to the said vehicle, and the trailing pair being set apart so as to contact the girder when the latter is coupled to the said vehicle.

9. A composite vehicle according to Claim 7 or Claim 8 wherein the girder is provided with a thickened section along the part thereof which engages the frame member when the said two parts of the composite vehicle are joined, and the depending legs of the frame member terminate at their free

ends in inwardly directed flanges which engage the underside of the said thickened portion of the girder, the gap between said flanges being sufficiently wide to permit the free end of the girder to pass through.

10. A composite vehicle according to any of Claims 6 to 9 wherein the vehicle of the first part further comprises a bracket mounted on the underside thereof and arranged to engagingly receive the free end of the girder when the said two parts of the composite vehicle are joined.

11. A composite road vehicle according to Claim 10 wherein the said bracket includes a pair of depending legs set apart to embrace the end of the girder, which legs are apertured to captively receive a horizontal pin which passes through the girder, there being a corresponding aperture in the girder, thereby fastening the girder to the said vehicle.

12. A composite road vehicle according to Claim 10 or Claim 11 further comprising means for drawing up the free end of the girder into engagement with the said bracket.

13. A composite road vehicle according to any of Claims 10 to 12 wherein the means for raising the rear wheel axles of the vehicle of the first part includes one or more bars welded to the girder at right angles and in a position such that when the girder engages the said bracket and the jack is retracted the bar or bars engage the rear wheel supports so as to compress the rear wheel suspensions.

14. A composite road vehicle according to any preceding claim further comprising matable parts at the rear top corners of the vehicle of the first part and corresponding parts on the said cart whereby the said two parts of the composite vehicle may be additionally releasably joined at the roof level at the said vehicle.

15. A composite road vehicle according to Claim 14 wherein the said mating means include quick release over-centre toggles which link corresponding lugs on the said two parts.

16. A composite road vehicle according to Claim 14 or Claim 15 wherein the said corresponding parts on the cart comprise lugs which are braced by means of an inverted U-shaped tube welded to the cart subframe.

17. A composite vehicle according to any preceding claim wherein the cart is equipped with an engine which drives its wheels directly and means is provided for coupling the controls of the cart engine with the manual controls of the vehicle of the first part.

18. A composite vehicle according to Claim 2 or any claim appendant thereto further comprising a winch for drawing the cart into engagement with the vehicle of the first part, ready for coupling with the latter.

19. A composite vehicle according to any preceding claim wherein the said cart comprises a caravan.

20. A composite vehicle substantially as described herein with reference to Figures 1 to 4 of the accompanying drawings or as modified as in Figure 5 thereof.